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Quantum communications based on quantum hashing

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Abstract

© Research India Publications. In this paper we consider an application of the recently proposed quantum hashing technique for computing Boolean functions in the quantum communication model. The combination of binary functions on non-binary quantum hash function is done via polynomial presentation, which we have called a characteristic of a Boolean function. Based on the characteristic polynomial presentation of Boolean functions and quantum hashing technique we present a method for computing Boolean functions in the quantum one-way communication model, where one of the parties performs his computations and sends a message to the other party, who must output the result after his part of computations. Some of the results are also true in a more restricted Simultaneous Message Passing model with no shared resources, in which communicating parties can interact only via the referee. We give several examples of Boolean functions whose polynomial presentations have specific properties allowing for construction of quantum communication protocols that are provably exponentially better than classical ones in the simultaneous message passing setting.

Keywords

Communication complexity, Quantum communications, Quantum hashing, Simultaneous message passing